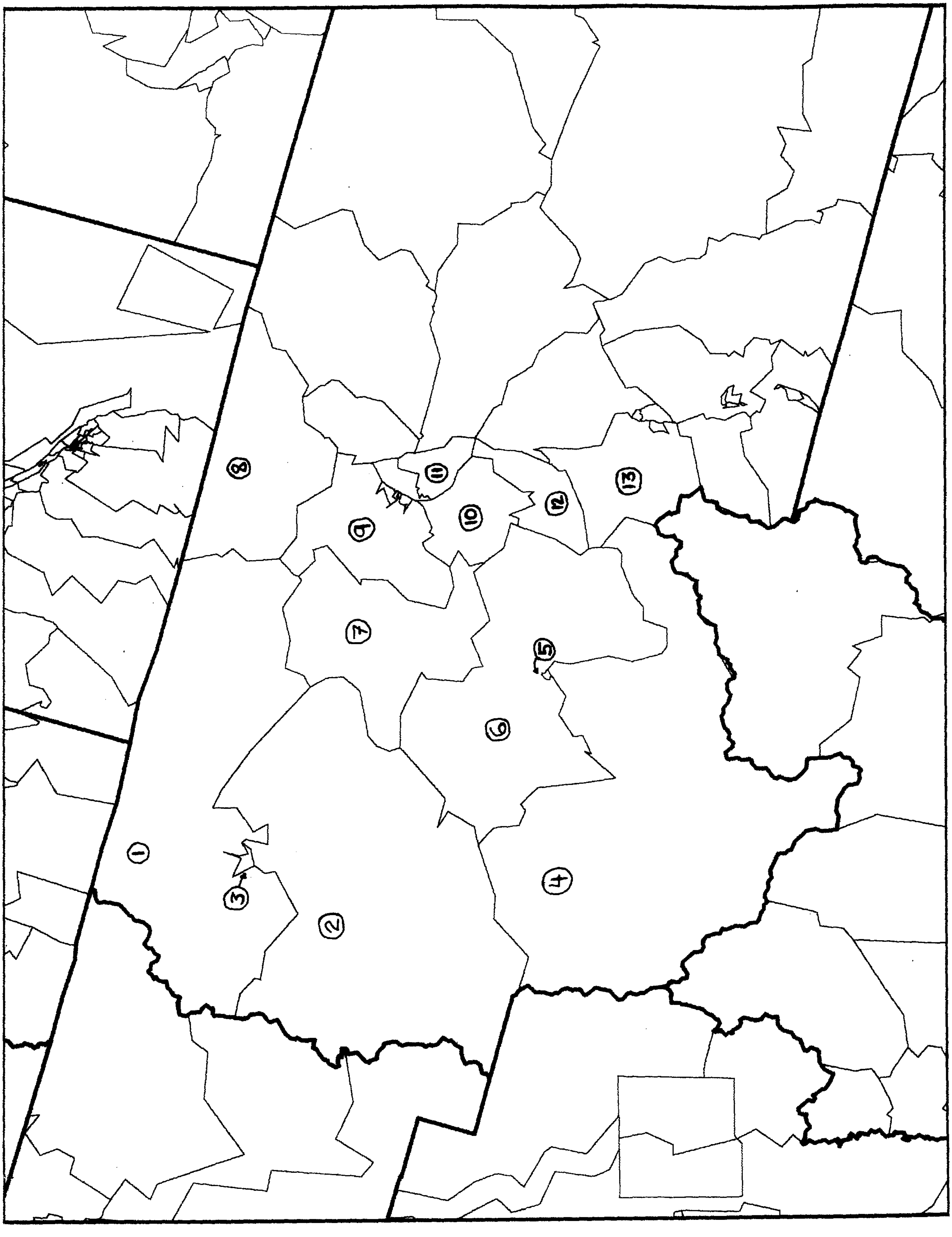
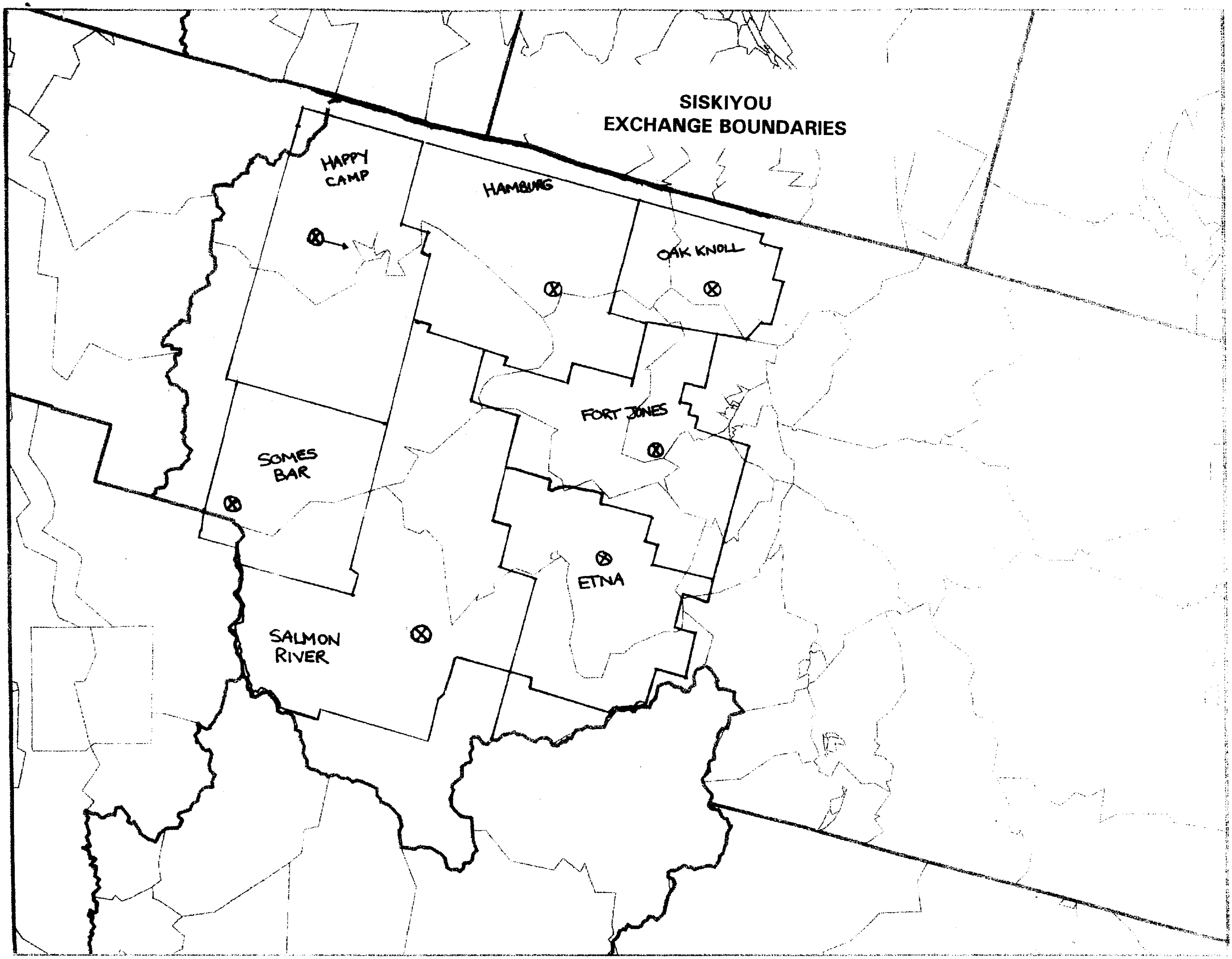


1
2
3
5
6
7
8
9
10
11
12
13
14


SISKIYOU
EXCHANGE BOUNDARIES
HAPPY
CAMP
HAMBURG
OAK KNOLL
SOMES
BAR
FORT JONES
ETNA
SALMON
RIVER

FEEDER AND DISTRIBUTION CABLES

% MIX BY DENSITY ZONES

	COPPER FEEDER <9000'			FIBER FEEDER >9000'			COPPER DISTRIBUTION		
DENSITY	UG	BURIED	AERIAL	UG	BURIED	AERIAL	UG	BURIED	AERIAL
0-10	21%	27%	52%	21%	27%	52%	0%	60%	40%
11-50	39%	16%	45%	39%	16%	45%	3%	60%	37%
51-150	66%	7%	27%	66%	7%	27%	5%	65%	30%
151-500	81%	3%	16%	81%	3%	16%	5%	65%	30%
501-2000	94%	1%	5%	94%	1%	5%	15%	70%	15%
2001-5000	97%	0.5%	2.5%	97%	0.5%	2.5%	20%	75%	5%
5001+	98.5%	0.5%	1%	98.5%	0.5%	1%	88%	10%	2%

ASSUMPTIONS

1) The % mix for copper feeder cables was developed from PLAN feeder information on feeder sections under 9000 feet. The mix by density zone was developed by sorting the feeder information by the density of the wire centers.

2) The % mix for fiber feeder cables were assumed to be the same as the copper feeder cables.

3) The % mix by density zones for copper distribution cable was based on the following:
- CPUC and local regulations which emphasize "out of sight" plant.
- Buried distribution cable is first choice except in cases where terrain type would drive excessive costs.

FEEDER AND DISTRIBUTION CABLES

AVERAGE CABLE SIZES BY DENSITY ZONES

	COPPER FEEDER <9000'			FIBER FEEDER >9000'			COPPER DISTRIBUTION		
DENSITY	UG	BURIED	AERIAL	UG	BURIED	AERIAL	UG	BURIED	AERIAL
0-10	774	111	143	48	48	24	323	153	66
11-50	952	182	248	48	48	24	243	298	201
51-150	1280	379	446	48	48	24	305	255	234
151-500	1708	400	577	48	48	24	543	284	337
501-2000	2025	720	835	48	48	24	526	266	377
2001-5000	2426	1333	1256	48	48	24	561	302	410
5001+	2712	1649	1356	48	48	24	599	386	414

ASSUMPTIONS

1) The average sizes for copper feeder cables were developed from PLAN feeder information on feeder sections under 9000 feet. The copper feeder cables in these sections were resized to reflect the reduced copper demand in the sections due to the forward looking policy to serve all services with feeder lengths over 9000 feet via fiber.

2) The average size fiber cables were based on the sizes of the fiber cables placed during 1991 to 1994.

Underground fiber cable	85C	42.42 fibers
Buried fiber cable	845C	49.65 fibers
Aerial fiber cable	812C	20.86 fibers

3) The average cable sizes for copper distribution cables were developed from the 1995 loop samples taken for OANAD study.

COST PROXY MODEL

AVERAGE UTILIZATION % BY DENSITY ZONES

DENSITY	COPPER FEEDER AVG UTILIZATION	FIBER FEEDER AVG UTILIZATION	PAIR-GAIN EQUIP. AVG UTILIZATION	DISTRIBUTION AVG UTILIZATION
0-10	53%	67%	69%	36%
11-50	59%	67%	71%	36%
51-150	64%	67%	71%	37%
151-500	66%	67%	68%	38%
501-2000	68%	67%	66%	39%
2001-5000	67%	67%	63%	39%
5001+	59%	67%	66%	40%

ASSUMPTIONS

The above utilization percentages are derived as follows :

1) Average Utilization Levels

<u>Copper Feeder</u> = EOY 94' actual utilization levels by density zone.

<u>Fiber Feeder</u> = Utilization levels based on a forward looking view of a residential network using 4 fibers per remote terminal system (2 fibers for transmit and receive and 2 fibers for protection).

<u>Pair-Gain (Equipped)</u> = EOY 94' actual utilization levels by density zone that measures working channels to the equiped capacity of th Remote Terminal (RT) - "Ready to Serve" (equiped with plug-ins).

<u>Copper Distribution</u> = Distribution plant is sized for two pairs per unit. The smallest standard cable size that covers this requirement is placed. These utilization levels also reflect second line usage by density zone.

The average utilization percentages were developed from information obtained from the EOY 1994 DCAS REPORT and were sorted into density zones using the 1994 densities for each wire center.

DISTRIBUTION POLE LINE ($ PER LINEAR FOOT) - FRC 1C

DENSITY	NORMAL	MED-DIF (ROCKS)	HIGH-DIF (ROCKH)	WATER
0-10	4.84	4.96	5.69	4.96
11-50	4.84	4.96	5.69	4.96
51-150	5.45	5.69	6.42	5.69
151-500	5.45	5.69	6.42	5.69
501-2000	4.02	4.02	4.02	4.02
2001-5000	4.02	4.02	4.02	4.02
5001+	4.02	4.02	4.02	4.02

ASSUMPTIONS

1) The following assumptions were used for aerial plant placements using a "forward looking" philosophy:

1.1 The urban areas (densities over 500) would be buried or underground plant except in cases where pole line costs would be shared with other utilities (joint pole agreements).

1.2 The rural areas (densities 0 to 500) would be a combination of solely and jointly owned poles when buried plant was not feasible. The cost tables for 0 - 500 were based on 25% solely owned and 75% jointly owned poles.

2) Solely Owned Poles

2.1 Investments for solely owned poles were developed using the $9.73 per foot of pole line from the PLAN/ESM cost deck and adjusted for density zone and type of terrain:

2.2 Modified the $9.73 per foot for solely owned poles for density:
- in density zones under 50 access lines per square mile, the modifing factors were developed to reflect lower costs for spotting material, easier work site access, less pavement, and less substructure congestion.
- in density zones between 50 and 500 access lines per square mile, the modifing factors reflect normal placing costs.

2.3 Modified the $9.73 per foot for solely owned poles by terrain:
- no modification in "normal terrain.
- modification factors in "med-difficulty terrain" reflect the increased placing costs due to hard or rocky soil.
- modification factors in "high-difficulty terrain" reflect the increased placing costs due solid rock.
- modification factors in "water" reflect costs similar to med-difficulty.

Modified Investments for Solely Owned Poles

Density Zone	Mod. Fact.	Normal Terrain	Mod. Fact.	Med-Difficulty Terrain	Mod. Fact.	High-Difficulty Terrain	Mod. Fact.	Water
0-10	0.75	$7.30	0.80	$7.78	1.10	$10.70	0.80	$7.78
11-50	0.75	$7.30	0.80	$7.78	1.10	$10.70	0.80	$7.78
51-150	1.00	$9.73	1.10	$10.70	1.40	$13.62	1.10	$10.70
151-500	1.00	$9.73	1.10	$10.70	1.40	$13.62	1.10	$10.70

3) Jointly Owned Poles

3.1 The investments for jointly owned pole line were developed using the purchase prices for poles and anchors from the Joint Pole Agreement with PG&E.

3.2 The cost were based on a 45' pole and a 23' attachment :
- joint pole purchase price is $603
- joint screw anchor for 6M guy purchase price is $115
- placement cost of 6M guy is $86 (from PLAN/ESM cost deck)

3.3 Pole line cost per linear foot is based on 6 joint poles, 2 joint anchors, and 2 guys every 1000 feet.

CALCULATION OF JOINTLY OWNED POLE LINE COST PER LINEAR FOOT

6	Joint Poles	@	$603	=	$3,618
2	Joint Anchors	@	$115	=	$230
2	Joint Guys	@	$86	=	$172
			TOTAL for 1000 ft.		$4,020

$4,020 / 1000 feet = $4.02

4) Summarization of Pole Line Investments

Normal Terrain - Density 0 -10

Type	Investment		% Occurrence		Weighted Investment
Solely Owned Poles	$7.30	x	25%	=	$1.83
Jointly Owned Poles	$4.02	x	75%	=	$3.02
			Melded Investment		**$4.84**

High-Difficulty Terrain - Density 50 -150

Type	Investment		% Occurrence		Weighted Investment
Solely Owned Poles	$13.62	x	25%	=	$3.41
Jointly Owned Poles	$4.02	x	75%	=	$3.02
			Melded Investment		**$6.42**

COST PROXY MODEL

FEEDER POLE LINE ($ PER LINEAR FOOT) - FRC 1C

DENSITY	NORMAL	MED-DIF (ROCKS)	HIGH-DIF (ROCKH)	WATER	2nd CABLE FACTOR
0-10	4.81	4.93	5.65	4.93	0.9935
11-50	4.79	4.91	5.63	4.91	0.9898
51-150	5.29	5.53	6.24	5.53	0.9720
151-500	5.19	5.42	6.11	5.42	0.9524
501-2000	3.58	3.58	3.58	3.58	0.8899
2001-5000	3.19	3.19	3.19	3.19	0.7926
5001+	2.89	2.89	2.89	2.89	0.7179

ASSUMPTIONS

1) The following assumptions were used for aerial plant placements using a "forward looking" philosophy:

1.1 The urban areas (densities over 500) would be buried or underground plant except in cases where pole line costs would be shared with other utilities (joint pole agreements).

1.2 The rural areas (densities 0 to 500) would be a combination of solely and jointly owned poles when buried plant was not feasible. The cost tables for 0 - 500 were based on 25% solely owned and 75% jointly owned poles.

2) Solely Owned Poles

2.1 Investments for solely owned poles were developed using the $9.73 per foot of pole line from the PLAN/ESM cost deck and adjusted for density zone and type of terrain:

2.2 Modified the $9.73 per foot for solely owned poles for density:
- in density zones under 50 access lines per square mile, the modifing factors were developed to reflect lower costs for spotting material, easier work site access, less pavement, and less substructure congestion.
- in density zones between 50 and 500 access lines per square mile, the modifing factors reflect normal placing costs.

2.3 Modified the $9.73 per foot for solely owned poles by terrain:
- no modification in "normal terrain.
- modification factors in "med-difficulty terrain" reflect the increased placing costs due to hard or rocky soil.
- modification factors in "high-difficulty terrain" reflect the increased placing costs due solid rock.
- modification factors in "water" reflect costs similar to med-difficulty.

3) Second Cable on the Pole Line

3.1 The percent occurrance of a second cable on a pole line was based on the % of the aerial feeder that would require a cable over 1500 pairs. 1500 pairs is the largest aerial cable that would be placed. A second cable factor was developed by dividing 1 by 1 plus the percentage [1 / (1 + %)].

Modified Investments for Solely Owned Poles

Density Zone	Mod. Fact.	Normal Terrain	Mod. Fact.	Med-Diff. Terrain	Mod. Fact.	High-Diff. Terrain	Mod. Fact.	Water
0-10	0.75	$7.30	0.80	$7.78	1.10	$10.70	0.80	$7.78
11-50	0.75	$7.30	0.80	$7.78	1.10	$10.70	0.80	$7.78
51-150	1.00	$9.73	1.10	$10.70	1.40	$13.62	1.10	$10.70
151-500	1.00	$9.73	1.10	$10.70	1.40	$13.62	1.10	$10.70

3) Jointly Owned Poles

3.1 The investments for jointly owned pole line were developed using the purchase prices for poles and anchors from the Joint Pole Agreement with PG&E.

3.2 The cost were based on a 45' pole and a 23' attachment :
- joint pole purchase price is $603
- joint screw anchor for 6M guy purchase price is $115
- placement cost of 6M guy is $86 (from PLAN/ESM cost deck)

3.3 Pole line cost per linear foot is based on 6 joint poles, 2 joint anchors, and 2 guys every 1000 feet.

CALCULATION OF JOINTLY OWNED POLE LINE COST PER LINEAR FOOT

Joint Poles	6 @	$603	=	$3,618
Joint Anchors	2 @	$115	=	$230
Joint Guys	2 @	$86	=	$172
		TOTAL for 1000 ft.		$4,020
$4,020	/	1000 feet	=	$4.02

CALCULATION OF 2nd CABLE FACTOR

ZONE #	%	FACTOR
1	0.65%	0.9935
2	1.03%	0.9898
3	2.88%	0.9720
4	5.00%	0.9524
5	12.37%	0.8899
6	26.16%	0.7926
7	39.29%	0.7179

4) Summarization of Pole Line Investments

Normal Terrain - Density 0 -10

Type	Investment		% Occurrence		Weighted Investment	2nd Cable Factor	Total Investment
Solely Owned Poles	$7.30	x	25%	=	$1.83		
Jointly Owned Pole	$4.02	x	75%	=	$3.02		
					$4.84	0.9935	**$4.81**

High-Difficulty Terrain - Density 50 -150

Type	Investment		% Occurrence		Weighted Investment	2nd Cable Factor	Total Investment
Solely Owned Poles	$13.62	x	25%	=	$3.41		
Jointly Owned Pole	$4.02	x	75%	=	$3.02		
					$6.42	0.972	**$6.24**

CONDUIT ($ PER DUCT-FOOT) - FRC 4C
FOR 0.0 KFT TO 9.0 KFT

DENSITY	NORMAL	MED-DIF (ROCK-S)	HIGH-DIF (ROCK-H)	WATER
0-10	12.25	17.20	22.70	22.70
11-50	14.25	20.25	25.05	25.05
51-150	17.95	24.48	30.28	30.28
151-500	18.45	25.95	33.45	33.45
501-2000	13.92	21.15	28.90	28.90
2001-5000	9.80	15.56	21.96	21.96
5001+	7.59	12.59	18.59	18.59

NOTE: The reduction in the cost per duct-foot in the three highest density zones reflects the requirement of more ducts which share the trenching cost.

ASSUMPTIONS

1) The above investments per duct foot were developed using the "A Cost" and "B Cost" from the PLAN/ESM cost deck and the number of ducts that would typically be required in each density zone and providing a spare maintenance duct, ducts for fiber, and air pipe.

2) "A Cost" includes :
- engineering labor
- inspection labor
- travel time
- set-up time
- inplace cost of underground vaults (typical size 8 1/2 x 4 1/2 x 6 1/2) spaced at 600 feet
- cut & replace @ $10/ft (added to each density zone by estimated % of occurrence)

3) "B Cost" includes :
- material cost of ducts
- labor for placement of ducts

4) modified "A Cost" by density zone for :
- material spotting becomes more difficult and costly as the density of the work area increases
- substructure congestion increases with density and causes delays and changes
- heavier traffic in denser areas increases the required lane controls and work area protection
- frequency of street crossings that increases the amount of cutting and repaving required as well as restricting the length of trench that can be opened at one time
- work hour restrictions are usually imposed in denser areas primarily do to commuter traffic

CONDUIT ($ PER DUCT-FOOT) - FRC 4C

FOR 0.0 KFT TO 9.0 KFT

FACTORS WERE ESTIMATED FOR EACH DENSITY ZONE AND TERRAIN TO REFLECT THE CONDITIONS LISTED IN ASSUMPTION # 4 AND APPLIED TO THE "A COST". THE "B COST" WAS ADDED TO GET THE TOTAL INVESTMENT PER TRENCH-FOOT WHICH WAS DIVIDED BY THE NUMBER OF DUCTS MINUS ONE MAINTENANCE DUCT TO DETERMINE THE INVESTMENT / DUCT-FOOT.

DENSITY	REQUIRED DUCTS (A)	A COST (B)	B COST (C)	MOD FACT (D)	MODIFIED A COST (E=BxD)	TOTAL B COST (F=AxC)	TOTAL INVEST TRENCH-FT (G=E+F)	NORMAL INVEST. /DUCT-FT (H=G/A-1)
0-10	3	22.00	2.30	0.80	17.60	6.90	24.50	[redacted]
11-50	3	24.00	2.30	0.90	21.60	6.90	28.50	[redacted]
51-150	3	29.00	2.30	1.00	29.00	6.90	35.90	[redacted]
151-500	3	30.00	2.30	1.00	30.00	6.90	36.90	[redacted]
501-2000	4	31.00	2.30	1.05	32.55	9.20	41.75	[redacted]
2001-5000	6	32.00	2.30	1.10	35.20	13.80	49.00	[redacted]
5001+	9	32.00	2.30	1.25	40.00	20.70	60.70	[redacted]

DENSITY	REQUIRED DUCTS (A)	A COST (B)	B COST (C)	MOD FACT (D)	MODIFIED A COST (E=BxD)	TOTAL B COST (F=AxC)	TOTAL INVEST TRENCH-FT (G=E+F)	MED-DIF INVEST. /DUCT-FT (H=G/A-1)
0-10	3	22.00	2.30	1.25	27.50	6.90	34.40	[redacted]
11-50	3	24.00	2.30	1.40	33.60	6.90	40.50	[redacted]
51-150	3	29.00	2.30	1.45	42.05	6.90	48.95	[redacted]
151-500	3	30.00	2.30	1.50	45.00	6.90	51.90	[redacted]
501-2000	4	31.00	2.30	1.75	54.25	9.20	63.45	[redacted]
2001-5000	6	32.00	2.30	2.00	64.00	13.80	77.80	[redacted]
5001+	9	32.00	2.30	2.50	80.00	20.70	100.70	[redacted]

DENSITY	REQUIRED DUCTS (A)	A COST (B)	B COST (C)	MOD FACT (D)	MODIFIED A COST (E=BxD)	TOTAL B COST (F=AxC)	TOTAL INVEST TRENCH-FT (G=E+F)	HIGH-DIF INVEST. /DUCT-FT (H=G/A-1)
0-10	3	22.00	2.30	1.75	38.50	6.90	45.40	[redacted]
11-50	3	24.00	2.30	1.80	43.20	6.90	50.10	[redacted]
51-150	3	29.00	2.30	1.85	53.65	6.90	60.55	[redacted]
151-500	3	30.00	2.30	2.00	60.00	6.90	66.90	[redacted]
501-2000	4	31.00	2.30	2.50	77.50	9.20	86.70	[redacted]
2001-5000	6	32.00	2.30	3.00	96.00	13.80	109.80	[redacted]
5001+	9	32.00	2.30	4.00	128.00	20.70	148.70	[redacted]

DENSITY	REQUIRED DUCTS (A)	A COST (B)	B COST (C)	MOD FACT (D)	MODIFIED A COST (E=BxD)	TOTAL B COST (F=AxC)	TOTAL INVEST TRENCH-FT (G=E+F)	WATER INVEST. /DUCT-FT (H=G/A-1)
0-10	3	22.00	2.30	1.75	38.50	6.90	45.40	[redacted]
11-50	3	24.00	2.30	1.80	43.20	6.90	50.10	[redacted]
51-150	3	29.00	2.30	1.85	53.65	6.90	60.55	[redacted]
151-500	3	30.00	2.30	2.00	60.00	6.90	66.90	[redacted]
501-2000	4	31.00	2.30	2.50	77.50	9.20	86.70	[redacted]
2001-5000	6	32.00	2.30	3.00	96.00	13.80	109.80	[redacted]

5001+	9	32.00	2.30	4.00	128.00	20.70	148.70	$\boxed{16.59}$

CONDUIT ($ PER DUCT-FOOT) - FRC 4C

SAMPLE CALCULATION OF $ PER DUCT-FOOT FOR "NORMAL TERRAIN - DENSITY 5000+

(A)	"A COST"	$22.00	(PER TRENCH FOOT)
(B)	CUT & REPLACE PAVEMENT	+ $10.00	(PER TRENCH FOOT)
(C)	SUB-TOTAL	$32.00	(PER TRENCH FOOT)
(D)	MODIFYING FACTOR	x 1.25	
(E=CxD)	TRENCHING COST ($32.00 x 1.25)	**$40.00**	(PER TRENCH FOOT)
(F)	"B COST"	$2.30	(PER DUCT-FOOT)
(G)	NUMBER OF DUCTS	x 9	
(H=FxG)	DUCT COST (9 x $2.30)	**$20.70**	(PER TRENCH FOOT)
(I=E+H)	TOTAL CONDUIT COST ($40.00+$20.70)	**$60.70**	(PER TRENCH FOOT)
(J)	USABLE DUCTS (9 - 1) (ONE DUCT MUST REMAIN SPARE FOR MAINTENANCE)	8	
(K=I/J)	COST PER DUCT-FOOT	$\boxed{\$7.59}$	

4C - CONDUIT ($ PER DUCT-FOOT)
FOR 9.0 KFT AND LONGER

DENSITY	NORMAL	MED-DIF (ROCK-S)	HIGH-DIF (ROCK-H)	WATER
0-10	15.10	22.30	30.30	30.30
11-50	18.50	27.50	34.70	34.70
51-150	25.30	35.65	44.85	44.85
151-500	26.30	38.30	50.30	50.30
501-2000	15.43	24.18	33.55	33.55
2001-5000	16.60	28.30	41.30	41.30
5001+	18.55	34.80	54.30	54.30

NOTE: The reduction in the cost per duct-foot in the three highest density zones is caused by the increase in the number of ducts required, therefore trenching costs are spread over more ducts.

ASSUMPTIONS

1) The above investments per duct foot were developed using the "A Cost" and "B Cost" from the PLAN cost deck and the number of ducts that would typically be required in each density zone.

2) "A Cost" includes :
- engineering labor
- inspection labor
- travel time
- set-up time
- inplace cost of underground vaults (typical size 8 1/2 x 4 1/2 x 6 1/2) spaced at 600 feet
- cut & replace @ $10/ft (added to each density zone by estimated % of occurrence)

3) "B Cost" includes :
- material cost of ducts
- labor for placement of ducts

4) modified "A Cost" by density zone for :
- material spotting becomes more difficult and costly as the density of the work area increases
- substructure congestion increases with density and causes delays and changes
- heavier traffic in denser areas increases the required lane controls and work area protection
- frequency of street crossings that increases the amount of cutting and repaving required as well as restricting the length of trench that can be opened at one time
- work hour restrictions are usually imposed in denser areas primarily do to commuter traffic

CONDUIT ($ PER DUCT-FOOT) - FRC 4C

FOR 9.0 KFT AND LONGER

FACTORS WERE ESTIMATED FOR EACH DENSITY ZONE AND TERRAIN TO REFLECT THE CONDITIONS LISTED IN ASSUMPTION # 4 AND APPLIED TO THE "A COST". THE "B COST" WAS ADDED TO GET THE TOTAL INVESTMENT PER TRENCH-FOOT WHICH WAS DIVIDED BY THE NUMBER OF DUCTS. THE "A COST" REFLECT ADJUSTMENT FOR 1500 FOOT SPLICE VAULT SPACING.

DENSITY	REQUIRED DUCTS (A)	A COST (B)	B COST (C)	MOD FACT (D)	MODIFIED A COST (E=BxD)	TOTAL B COST (F=AxC)	TOTAL INVEST TRENCH-FT (G=E+F)	NORMAL INVEST. /DUCT-FT (H=G/A)
0-10	1	16.00	2.30	0.80	12.80	2.30	15.10	**15.10**
11-50	1	18.00	2.30	0.90	16.20	2.30	18.50	**18.50**
51-150	1	23.00	2.30	1.00	23.00	2.30	25.30	**25.30**
151-500	1	24.00	2.30	1.00	24.00	2.30	26.30	**26.30**
501-2000	2	25.00	2.30	1.05	26.25	4.60	30.85	**15.43**
2001-5000	2	26.00	2.30	1.10	28.60	4.60	33.20	**16.60**
5001+	2	26.00	2.30	1.25	32.50	4.60	37.10	**18.55**

DENSITY	REQUIRED DUCTS (A)	A COST (B)	B COST (C)	MOD FACT (D)	MODIFIED A COST (E=BxD)	TOTAL B COST (F=AxC)	TOTAL INVEST TRENCH-FT (G=E+F)	MED-DIF INVEST. /DUCT-FT (H=G/A)
0-10	1	16.00	2.30	1.25	20.00	2.30	22.30	**22.30**
11-50	1	18.00	2.30	1.40	25.20	2.30	27.50	**27.50**
51-150	1	23.00	2.30	1.45	33.35	2.30	35.65	**35.65**
151-500	1	24.00	2.30	1.50	36.00	2.30	38.30	**38.30**
501-2000	2	25.00	2.30	1.75	43.75	4.60	48.35	**24.18**
2001-5000	2	26.00	2.30	2.00	52.00	4.60	56.60	**28.30**
5001+	2	26.00	2.30	2.50	65.00	4.60	69.60	**34.80**

DENSITY	REQUIRED DUCTS (A)	A COST (B)	B COST (C)	MOD FACT (D)	MODIFIED A COST (E=BxD)	TOTAL B COST (F=AxC)	TOTAL INVEST TRENCH-FT (G=E+F)	HIGH-DIF INVEST. /DUCT-FT (H=G/A)
0-10	1	16.00	2.30	1.75	28.00	2.30	30.30	**30.30**
11-50	1	18.00	2.30	1.80	32.40	2.30	34.70	**34.70**
51-150	1	23.00	2.30	1.85	42.55	2.30	44.85	**44.85**
151-500	1	24.00	2.30	2.00	48.00	2.30	50.30	**50.30**
501-2000	2	25.00	2.30	2.50	62.50	4.60	67.10	**33.55**
2001-5000	2	26.00	2.30	3.00	78.00	4.60	82.60	**41.30**
5001+	2	26.00	2.30	4.00	104.00	4.60	108.60	**54.30**

DENSITY	REQUIRED DUCTS (A)	A COST (B)	B COST (C)	MOD FACT (D)	MODIFIED A COST (E=BxD)	TOTAL B COST (F=AxC)	TOTAL INVEST TRENCH-FT (G=E+F)	WATER INVEST. /DUCT-FT (H=G/A)
0-10	1	16.00	2.30	1.75	28.00	2.30	30.30	**30.30**
11-50	1	18.00	2.30	1.80	32.40	2.30	34.70	**34.70**
51-150	1	23.00	2.30	1.85	42.55	2.30	44.85	**44.85**
151-500	1	24.00	2.30	2.00	48.00	2.30	50.30	**50.30**
501-2000	2	25.00	2.30	2.50	62.50	4.60	67.10	**33.55**
2001-5000	2	26.00	2.30	3.00	78.00	4.60	82.60	**41.30**

5001+	2	26.00	2.30	4.00	104.00	4.60	108.60	**54.30**

COST PROXY MODEL

CONDUIT ($ PER DUCT-FOOT) - FRC 4C
DISTRIBUTION

DENSITY	ALL TERRAINS
0-10	9.50
11-50	9.50
51-150	9.50
151-500	9.50
501-2000	9.50
2001-5000	9.50
5001+	9.50

ASSUMPTIONS

1) The above investments per duct foot were developed as follows :

$5.00	Trench
$2.00	1 - 4" duct
$2.50	Handholes
$9.50	

2) Typical subdivisions with buried or underground plant would not be constructed in areas with other than "normal" digging conditions. This avoids inflating the distribution conduit costs because a CBG has other than NORMAL terrain digging conditions.

3) The $5.00 trenching cost is the state wide average buried trenching cost from the PLAN/ESM cost deck and includes trenching, cut and replace, all restoration, engineering, travel time, etc.

4) The $2.00 for the one 4" duct is the inplace cost and includes material costs as well as the labor for placing the duct in the trench,

5) The $2.50 for handholes is the inplace cost and includes material costs as well as labor for placing ($1500 @ spaced at 600 feet).

COST PROXY MODEL

MODIFYING FACTORS
UG COPPER AND FIBER (FEEDER AND DISTRIBUTION)
FRCs 5C AND 85C

DENSITY	ALL TERRAINS
0-10	1.00
11-50	1.00
51-150	1.00
151-500	1.00
501-2000	1.10
2001-5000	1.20
5001+	1.40

ASSUMPTIONS

1) These factors modified the "A Cost" and "B Cost" by density zone.
- Spotting of material in the less dense zones can be close to the work location. In denser areas, finding suitable areas close to the work location is difficult.
- Heavier traffic which requires lane controls and well guarded work location is more frequently encountered in more dense areas.
- Underground vaults are larger in denser areas thus pumping water out of vaults takes longer.
- Work hour restrictions are necessary in denser areas due traffic congestion at commute hours. Its not uncommon to work nights due to city rules.

2) The placing of underground copper and fiber cables in conduit is impacted more by conditions caused by density than terrain

COST PROXY MODEL

MODIFYING FACTORS
AERIAL COPPER AND FIBER (FEEDER AND DISTRIBUTION)
FRCs 12C AND 812C

DENSITY	ALL TERRAIN
0-10	1.00
11-50	1.00
51-150	1.00
151-500	1.00
501-2000	1.10
2001-5000	1.20
5001+	1.40

ASSUMPTIONS

1) These factors modified the "A Cost" and "B Cost" by density zone.
- Spotting of material in the less dense zones can be close to the work location. In denser areas, finding suitable areas close to the work location is difficult.
- Heavier traffic which requires lane controls and well guarded work location is more frequently encountered in more dense areas.
- Work hour restrictions are necessary in denser areas due traffic congestion at commute hours. Its not uncommon to work nights due to city rules.
- In denser areas street crossings require more traffic control.

2) The placing of aerial copper and fiber cables on poles is impacted more by conditions caused by density than terrain

MODIFYING FACTORS
BURIED COPPER AND FIBER (FEEDER AND DISTRIBUTION)
FRCs 45C AND 845C

DENSITY	NORMAL	MED-DIF (ROCKS)	HIGH-DIF (ROCKH)	WATER
0-10	0.80	1.17	1.50	1.50
11-50	0.90	1.26	1.51	1.51
51-150	1.00	1.24	1.45	1.45
151-500	1.00	1.27	1.55	1.55
501-2000	1.00	1.34	1.67	1.67
2001-5000	1.10	1.38	1.68	1.68
5001+	1.20	1.56	1.98	1.98

ASSUMPTIONS

1) These factors modified the "A Cost" and "B Cost" by density zone.
- Spotting of material in the less dense zones can be close to the work location. In denser areas, finding suitable areas close to the work location is difficult.
- Heavier traffic which requires lane controls and well guarded work location is more frequently encountered in more dense areas.
- Work hour restrictions are necessary in denser areas due traffic congestion at commute hours. Its not uncommon to work nights due to city rules.
- In denser areas street crossings require more traffic control and restrict the footage of open trench available at a time.
- Denser areas will require more repaving cost
- Denser areas have much more substructure congestion (water, gas, sewer etc.)
- Rocks and water increases labor proportional to the amount of water and the amount and size of the rocks.

COST PROXY MODEL

DROP INVESTMENT PER LINE

	TERMINAL $		TERMINAL MIX		AVG INVES	% 1 & 2	AVG INVEST
	BURIED	AERIAL	BURIED	AERIAL	SUB TOTA	LIV.UNIT	SINGLE FAM.
	A	B	C	D	E	F	G
DENSITY					(A*C)+(B*D)		E * F
0 - 10	$ 183.85	$ 171.75	60%	40%	$ 179.01	91%	**$ 162.90**
11 - 50	$ 182.16	$ 172.32	63%	37%	$ 178.52	90%	**$ 160.67**
51 - 150	$ 169.76	$ 163.32	70%	30%	$ 167.83	86%	**$ 144.33**
151 - 500	$ 114.04	$ 115.08	70%	30%	$ 114.35	80%	**$ 91.48**
501 - 2000	$ 67.63	$ 73.56	85%	15%	$ 68.52	74%	**$ 50.71**
2001-5000	$ 66.50	$ 74.13	95%	5%	$ 66.88	68%	**$ 45.48**
5000+	$ 55.34	$ 63.62	98%	2%	$ 55.51	47%	**$ 26.09**

ASSUMPTIONS

1) LONGER DROP LENGTHS AS DENSITY DECREASES

2) LABOR HOURS INCLUDE COST OF DROP TERMINATION, TRAFFIC CONTROL IN DENSE AREAS, HOUSE ATTACH. AND SNI TERMINATION.

3) % ADL SOURCE - PARIS/FIMS

4) % SINGLE FAMILY SOURCE - 1990 CENSUS

5) MATL. COST SOURCE - NOVA

6) AERIAL/BURIED MIX BASED ON FORWARD LOOKING PLANT

COST PROXY MODEL

TERMINALS - INVESTMENTS PER LINE

	TERMINAL $		TERMINAL MIX		AVG INVEST	% 1 & 2	AVG INVEST	
	BURIED	AERIAL	BURIED	AERIAL	SUB TOTAL	LIV.UNIT	SINGLE FAM.	
	A	B	C	D	E	F	G	
DENSITY					(A*C)+(B*D)		E * F	
0 - 10	$ 347.72	$ 188.48	60%	40%	$ 284.02	91%	$	**258.46**
11 - 50	$ 311.51	$ 166.89	63%	37%	$ 258.00	90%	$	**232.20**
51 - 150	$ 243.03	$ 129.41	70%	30%	$ 208.94	86%	$	**179.69**
151 - 500	$ 176.24	$ 93.27	70%	30%	$ 151.35	80%	$	**121.08**
501 - 2000	$ 85.86	$ 45.44	85%	15%	$ 79.80	74%	$	**59.05**
2001-5000	$ 56.28	$ 29.78	95%	5%	$ 54.96	68%	$	**37.37**
5000+	$ 33.49	$ 17.72	98%	2%	$ 33.17	47%	$	**15.59**

ASSUMPTIONS

1) Consolidation of construction garages adds to travel time in all zones.
   a. Rural areas due to distance traveled.
   b. Urban areas due to freeways and traffic congestion.

2) % ADL SOURCE - PARIS/FIMS

3) % SINGLE FAMILY SOURCE - 1990 CENSUS

4) MATL. COST SOURCE - NOVA

5) AERIAL/BURIED MIX BASED ON FORWARD LOOKING PLANT

COST PROXY MODEL

SERVING AREA INTERFACE (SAI)
(AND CROSS CONNECTS)

INVESTMENT PER LINE

DENSITY	SAI $	% SAI	$ PER LN	BLDG $	% BLDG.	$ PER LN	X CONN $	% X CONN	$ PER LN	TOTAL $
	A	B	C=AxB	D	E	F=DxE	G	H	I=GxH	J=C+F+I
0 - 10	$ 57.14	5%	$ 2.86	$ 75.85	8%	$ 6.07	$ 81.40	87%	$ 70.82	$ 79.74
11 - 50	$ 45.71	25%	$ 11.43	$ 39.48	10%	$ 3.95	$ 75.40	65%	$ 49.01	$ 64.39
51 - 150	$ 38.09	50%	$ 19.05	$ 28.88	14%	$ 4.04	$ 31.40	36%	$ 11.30	$ 34.39
151 - 500	$ 21.16	80%	$ 16.93	$ 23.58	20%	$ 4.72	$ -	0%	N/A	$ 21.65
501 - 2000	$ 21.16	74%	$ 15.66	$ 18.65	26%	$ 4.85	$ -	0%	N/A	$ 20.51
2001 - 5000	$ 21.16	68%	$ 14.39	$ 18.57	32%	$ 5.94	$ -	0%	N/A	$ 20.33
> 5000	$ 17.25	47%	$ 8.11	$ 18.52	53%	$ 9.82	$ -	0%	N/A	$ 17.92

ASSUMPTIONS

1) % USE OF DIFFERENT TYPES OF X-CONN DIFFERS BY DENSITY ZONE

2) % MIX OF BLDG TERM PER DENSITY ZONE IS FROM 1990 CENSUS SINGLE FAMILY / MULTI-FAMILY

3) % USE OF SAI/X-CONN IN DENSITY ZONES DEVELOPED BY A PANEL OF SUBJECT MATTER EXPERTS.

COST PROXY MODEL

PAIR GAIN EQUIPMENT INVESTMENTS - FRC 257C
(DIGITAL LOOP CARRIER)

DENSITY	FIXED $ PER LOC	VARIABLE $ PER PR	CHAN. CAP.
0-10	27800	121	24
11-50	34800	271	96
51-150	34800	271	96
151-500	115000	125	672
501-2000	115000	125	672
2001-5000	140000	125	1344
5001+	140000	125	1344

SAMPLE INVESTMENT DEVELOPMENT

ONU - 24

RT INCLUDING CABINET	$15,000	
CO HDFB	$2,000	
CO OPTICAL LINE UNIT	$800	
MISC *	$10,000	
RT PLUG-IN	$2,400	
COT PLUG-IN	$500	
TOTAL	$30,700	
FIXED	$27,800	
VARIABLE	$2,900	(plug-ins)

ONU - 96

RT INCLUDING CABINET	$20,000
CO HDFB	$2,000
CO OPTICAL LINE UNIT	$800
MISC *	$12,000
RT PLUG-IN	$24,000
COT PLUG-IN	$2,000
TOTAL	$60,800
FIXED	$34,800
VARIABLE	$26,000

LITESPAN 2000 - 672 capacity

RT INCLUDING CABINET	$75,000	
MISC *	$25,000	
COT	$15,000	
RT PLUG-IN	$67,200	
COT PLUG-IN	$16,800	
TOTAL	$199,000	
FIXED	$115,000	
VARIABLE	$84,000	(plug-ins)

LITESPAN 2000 - 1344 capacity

RT INCLUDING CABINET	$100,000
MISC *	$25,000
COT	$15,000
RT PLUG-IN	$134,400
COT PLUG-IN	$33,600
TOTAL	$308,000
FIXED	$140,000
VARIABLE	$168,000

* MISC INCLUDES BATTERIES, AC POWER, PED MOUNT, PAD, PROTECTORS, R/W, & SPLICING

NOTE : **THE NUMBERS SHOWN ARE NOT REAL INVESTMENTS WHICH ARE PROPRIETARY INFORMATION. THESE NUMBERS ARE ONLY INTENTED TO DEMONSTRATE THE METHOD.**

COST PROXY MODEL

% FEEDER

DENSITY	DISTANCE FROM C.O.			
	0-9 KFT	9-15 KFT	15-24 KFT	24 KFT+
0-10	64%	60%	67%	82%
10-50	64%	60%	67%	82%
50-150	64%	60%	73%	85%
150-500	64%	73%	86%	92%
500-2000	68%	83%	89%	90%
2000-5000	77%	85%	89%	93%
5000+	85%	89%	93%	93%

This table is used to determine the feeder and distribution lengths when data is not available in existing data bases.

The % feeder table was developed from the 1254 loop samples taken in 1995 for the OANAD study. The cable and pair data was sorted by density zone and distance from the wire center. In those cases where there were no loops for a distance within a density zone, engineering judgment was used to arrive at the appropriate split.